Teche/Vermilion Blue Thumb Water Monitoring Project

Acadiana Resource, Conservation and Development (RC&D) Council

Quality Assurance Project Plan (QAPP)

DEQ Contract # 547641

July 12, 2001

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Teche/Vermilion Blue Thumb
Water Monitoring Project
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DEQ Contract #547641
Quality Assurance Project Plan

Approving Officers:

Acadiana Resource, Conservation and Development (RC&D) Council

_____
Kelly Taylor, Project Coordinator Date:

Louisiana Department of Environmental Quality

_____
John James Clark, Project Manager Date:

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Jan Boydstun, NPS Coordinator Date:

_____
Stephanie Braden, QA Coordinator Date:

Environmental Protection Agency, Region 6

_____
Carmen Assunto, Project Officer Date:
State and Tribal Program

_____
Joan Brown, Chief Date:
Assistance Programs Branch

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Distribution List

Acadiana Resource Conservation and Development Council

Kelly Taylor, Project Coordinator

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Louisiana Department of Environmental Quality

Jan Boydstun, NPS Coordinator

John James Clark, Project Manager

Stephanie Braden, QA Coordinator

United States Environmental Protection Agency, Region 6

Carmen Assunto, Project Officer
State and Tribal Programs

Joan Brown, Chief, Assistant Program Branch

Project /Task Organization

Roles and Responsibilities

United States Environmental Protection Agency (US EPA), Region 6
Carmen Assunto, Project Officer, State and Tribal Program
Responsible for providing EPA guidance.

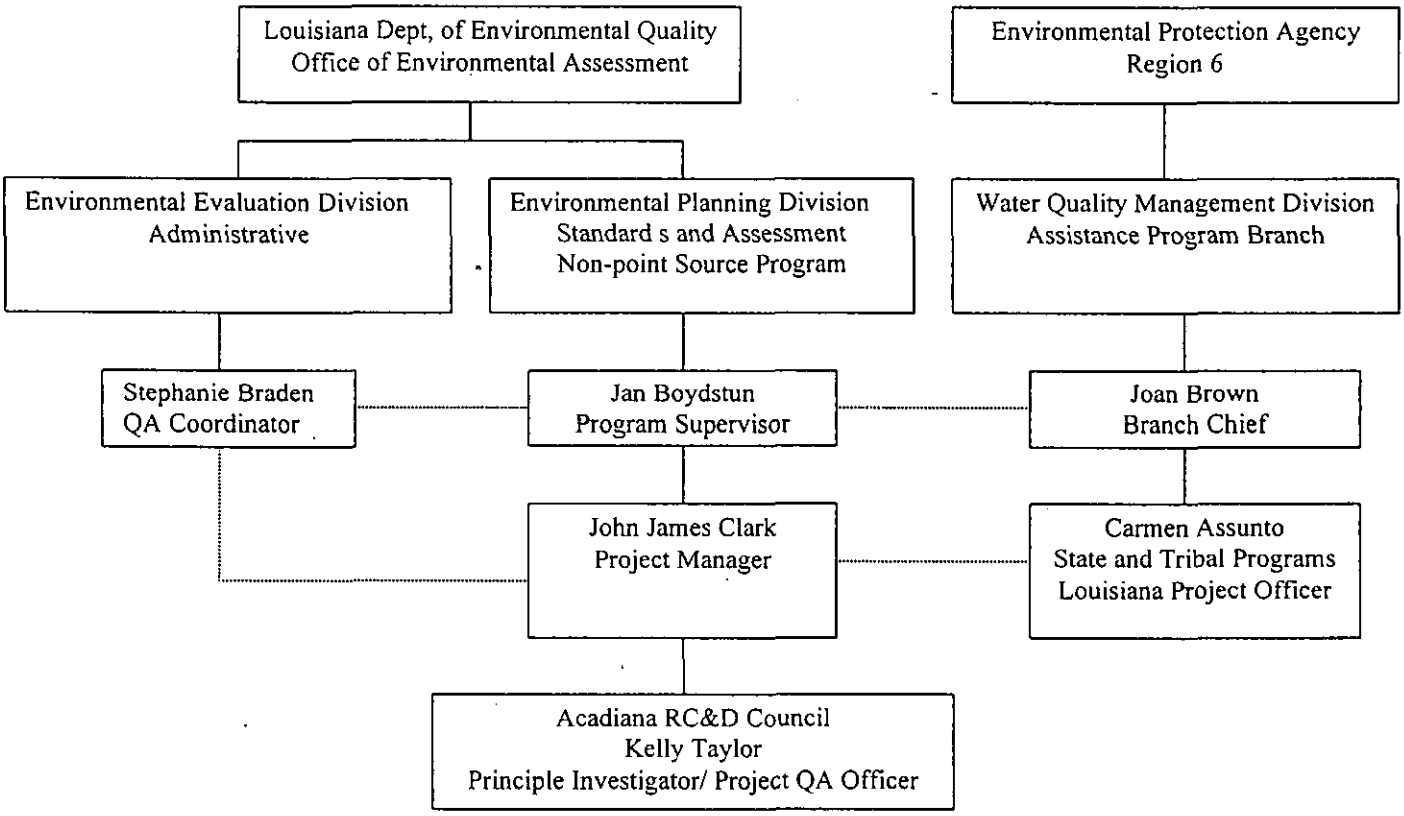
Louisiana Department of Environmental Quality
John James Clark, Project Manager
Responsible for project oversight, review of all quarterly, annual and final reports. Also responsible for reporting project progress to EPA.

Jan Boydstun, NPS Coordinator
Responsible for incorporation of results from the project into the state's NPS Management Program and utilization of data for education on NPS pollution problems.

Acadiana Resource, Conservation and Development (RC&D) Council
Kelly Taylor, Teche/Vermilion Blue Thumb Project Coordinator
Responsible for project operation and oversight, including project activities, tasks, milestones, output planning, sample collection, volunteer recruitment, field analysis and QA activities.

Debby Touchet, Administrative Assistant
Responsible for budget tracking and compiling reports for quarterly submission.

Non-Point Source Project Organization
Blue Thumb Volunteer Monitoring in the Acadiana Area



Problem Identification/Background

The 1999 Nonpoint Source Pollution Management Plan concluded that nonpoint source pollution is a principle remaining cause of water quality degradation. As controls on point source discharges intensify, diffuse sources appear to be increasingly important contributors to use impairment. Urban stormwater runoff, runoff from agricultural and silvicultural operations, and malfunctioning septic systems all contribute significant pollution loading to both surface and ground water.

According to the 2000 Louisiana Water Quality Inventory Report (305(b)), nonpoint sources are significant contributors to Louisiana's water quality problems. Not surprisingly, nonpoint source pollution has been identified as one of the major sources of pollution in the Teche-Vermilion River Basin, including land development, urban runoff, septic tanks, removal of riparian vegetation and crop production. One of the keys to basin-wide clean up efforts will be the control of nonpoint sources of pollution.

In order to reduce nonpoint source pollution, the cooperation and assistance from an informed public is necessary. Citizen water monitoring activities may be used as educational tools to educate people about nonpoint source pollution and how it relates to water quality. The monitoring, combined with watershed education programs that address nonpoint source pollution and best management practices, provide local citizens with information about ways they can improve water quality in their local watershed.

Project/Task Description

In an effort to educate the citizens throughout the Vermilion/Teche watershed, a hands-on water quality monitoring educational program will be implemented through contract with the Acadiana RC&D Council. This program, the Teche/Vermilion Blue Thumb Water Monitoring Program, will compliment the over all goals of the Teche/Vermilion Blue Thumb Project. The data collected through the water-monitoring program will be used for educational purposes only and will not be considered in assessments.

A Volunteer Monitoring Training Workshop is an important component of the Blue Thumb Project. This workshop will be offered once per year in the Fall. At of the workshop, volunteers will be introduced to the concepts of nonpoint source (NPS) pollution and trained to monitor the quality of their local water bodies at selected sites throughout Acadiana. Volunteers will monitor these selected sites once a month for a period of at least one year. The following basic water quality parameters will be measured at each site: water temperature, turbidity, dissolved oxygen, pH, nitrates, ammonia, orthophosphate, and chloride. These measurements are commonly made throughout aquatic systems to evaluate the general health of a system.

Volunteers will also be trained on how to properly record visual observations. These observations will reflect land use, the obvious water conditions (i.e. oil slick, film of pollen, floating debris, etc) and weather conditions.

Audits and reviews of volunteer monitoring practices will be conducted at random throughout the project period. Results of these audits and reviews will be an important component in determining the quality of the data. Reports will be made quarterly to LDEQ, including data and quality assurance information. Additional reporting to LDEQ will be done on an as-needed basis regarding possible water quality and/or data quality concerns. A final report will be submitted to LDEQ for review and approval.

Project Quality Objectives

The volunteer monitoring activities for this program are intended to provide information and data that will provide for an educational base, through hands-on experience, for teaching general water quality principles. Due to the nature of the Blue Thumb Water Monitoring Activities, typical data quality indicators cannot be quantitatively expressed. The function of the Blue Thumb Water Monitoring Data is not to draw scientific conclusions, but instead to familiarize citizens with their watershed while allowing them to develop their own concept of water quality. The following table illustrates the measurement range for those parameters measured with field sampling kits:

Matrix	Parameter	Measurement Range
Water	Temperature	0 to 38° C
Water	PH	2 to 11 units
Water	Turbidity	Secchi Disk
Water	Dissolved Oxygen	1 to 20 mg/l
Water	Nitrates	0 to 5 mg/l N
Water	Ammonia	0 to 5 mg/l NH3
Water	Orthophosphate	0 to 5 mg/l P
Water	Chloride	0 to 400 mg/l Cl

The measurement ranges are the primary acceptance criteria for the data. Quality control information collected by the project QA officer throughout project period and at QC workshops will also be used to determine quality of data for educational purposes.

Section A8

Training Requirements/Certification

Each Blue Thumb Volunteer will be required to attend a Volunteer Monitoring Training Workshop, which will occur once per year in the Fall. At the workshop, volunteers will be shown the Nonpoint Source (NPS) Pollution Enviroscape. This tool will be utilized to help volunteers make a connection between their daily activities, NPS Pollution and the parameters the volunteers will be testing for. Each of the parameters (outlined in Section A6) being tested for will be introduced so that every volunteer has a firm understanding of that particular parameter. The Blue Thumb Coordinator will demonstrate the testing procedures for each of the tests, one step at a time and one test at a time. As each test is completed, the volunteers will have the opportunity to run the same test under the supervision of the Coordinator.

Documentation and Records

For each series of tests performed, volunteers will be required to complete the **Blue Thumb Data Sheet** (Appendix A). The original data sheets will be returned to the Acadiana RC&D office via mail after each sampling event.

Upon receipt of the completed survey forms, the Blue Thumb Project Coordinator will review the data to assure that it is consistent, accurate and reliable. Additionally, the monitoring data will be entered into a database on site. Tests with unusual or unfavorable results or problems will be referred to LDEQ for review.

Reports to be submitted to LDEQ for this project include a report of the Volunteer Monitoring Training Workshop, the Quality Assurance /Quality Control Workshops, the Quarterly Report and Final Report. All workshop reports will include a volunteer attendance list, the agenda and a list of the materials supplied to the participants. These reports, along with all water quality monitoring data collected during this project, will be submitted with the subsequent quarterly monitoring reports to LDEQ. At the end of the project, a summary of all data collected from the citizens' monitoring activities will be provided in the Final Report to LDEQ.

Section B1

Sampling Sites

Maps will be provided to LDEQ on a quarterly basis to show the locations of newly adopted monitoring stations. Sampling can be conducted in the four major cities along the Teche and Vermilion-Abbeville, Lafayette, New Iberia and Breaux Bridge. Volunteer groups not located within the city limits will be able to select sites in between these cities. These sites will be chosen based on accessibility and safety. Location of sample sites, including the sampling site maps, should be provided in the Quarterly Monitoring Report.

Map Goes Here

Sampling Procedures

Volunteers will have access to a field box that contains:

Hach Test Kits (ammonia, chloride, nitrate, dissolved oxygen, pH, and orthophosphates)

Thermometer	Latex gloves	Clipboard with data sheets
Testing instructions	Lab detergent	Stirrer
Scissors/finger nail clipper	Pencil	Permanent marker
Syringe	Brushes	Trash bags
Goggles	Bucket	Secchi disk
Deionized water	Old milk jug to contain liquid waste	
Plastic container for dry waste		Plastic bucket with handle

* Volunteers may wish to add other items to the field such as plastic rain ponchos, small stopwatch or clock, sunscreen, calculator, etc.

Water will be collected for the samples using a clean plastic bucket. The sample will be collected one foot from the bank in open water by lowering the bucket into the water on a rope. The sample will be collected without disturbing the bottom sediment. In shallow waters, water will be carefully be scooped into the bucket using a sweeping motion, taking care not to disturb the bottom sediment. Water will be transferred from the bucket directly into test tubes for each test. To avoid the introduction of excess oxygen into the water, water for the dissolved oxygen test will be collected without the aid of a bucket.

Section B3

Sample Handling and Custody Requirements

All sampling, testing and data recording will be done at the monitoring stations. Therefore no sample handling or custody requirements have been included within this QAPP.

Section B4

Analytical Methods Requirements

Analytical methods utilized for testing water are those accepted and described in the HACH water quality test kits. **Procedures** for the water quality tests utilized in this program are found in Appendix B.

Quality Control Requirements

To ensure that volunteers continue to collect quality data, they will be tested to determine if their sampling and data recording skills are adequate. Volunteers will be required to attend a Quality Assurance/Quality Control (QA/QC) Workshop four months after the initial training, and every four months there after. During this phase of the workshop, the coordinator observes the volunteers as they are testing water on site and fills out a simple **Quality Assurance Checklist** to determine if procedures were performed correctly (See Appendix A). Volunteers must also fill out the data sheet correctly. The trainer does not participate but observes all activities and completes the review form. Any errors in technique or recording made by the volunteer will be explained at the end of the observation so that he or she can learn from their mistakes. The end of the workshop provides for an open discussion about water quality issues in the community and testing techniques, as well as a review of the collected data.

In addition to the QA/QC Workshops, the Coordinator will arrive on the testing site unannounced to observe randomly selected volunteers. The **Quality Assurance Checklist** will be completed and any errors made by the volunteer will be explained at the end of the observation. The quarterly report following the QA/QC workshop will include the results of the QA/QC workshop. Six months from the date of the volunteer training session, a report will be submitted by the Blue Thumb Coordinator to LDEQ detailing the results of the field tests and station checks.

Section B6

Instrument/Equipment Testing, Inspection, and Maintenance Requirements

Hach brand test kits, thermometers and a secchi disk will be the only items used for data collection. Volunteers will be required to inspect all of the contents of their test kits after each use. If reagents have expired or if items are broken or missing, the volunteer will notify the Coordinator immediately. Replacements will be ordered from Hach to remain consistent.

Volunteers will be required to clean their test kits after every monitoring experience. Several drops of Liquinox (a laboratory grade detergent) and warm water will be used to clean the equipment. Afterwards, it will be rinsed in warm tap water and again thoroughly with deionized water. After air drying, the glassware and other equipment will be put away and stored in a safe place at room temperature.

Instrument Calibration and Frequency

No electronic equipment will be used in the monitoring process, so calibration will not be necessary.

Section B8

Inspection/ Acceptance Requirements for Supplies

Volunteers will be required to inspect their test kits after each use and prior to the next use. All items should be checked for signs of normal wear and abuse. Any items that are not in usable order will be immediately replaced. At the Quality Assurance/Quality Control Workshop and unannounced visits, the Coordinator will inspect the kits.

Section B9

Data Acquisition Requirements

Only data collected by the volunteers will be used for this project. No outside data acquisition is required.

Section B10

Data Management

Volunteers will mail their data sheets to the RC&D office that will then forward them to LDEQ for review. The data will be thoroughly reviewed by the Blue Thumb Coordinator before it is forwarded to LDEQ. Acceptable data (See Sections A7 and D) will be entered into the Blue Thumb database and a copy will be returned to the volunteer. Volunteers will be contacted to resolve any problems or errors found on their data sheets.

Assessment and Response Actions

If volunteers need additional training or are unsure of testing techniques, the Coordinator will be available to visit their site and assist them with their first monitoring event. Additionally, detailed, step-by-step testing instructions will be included with each test kit. Each item in the test kit is clearly labeled, so instructions are easy to follow. See Section B5 for additional assessment and response actions.

Section C2

Reports to Management

Monitoring data will be supplied to the Louisiana Department of Environmental Quality quarterly and in a final report. The data will also be supplied within 10 working days if requested by LDEQ. LDEQ will review submitted data and contact the Blue Thumb Project Coordinator with any questions or concerns related to the submitted data. The Coordinator will investigate the questions and concerns and report back to LDEQ with the findings.

The Blue Thumb Coordinator will submit a quality assurance report to LDEQ, which is to be included with a subsequent quarterly report, within two months of the Quality Assurance/Quality Control workshop. The report will contain the results of the workshop held four months after the initial monitoring has begun.

Schedule of Quarterly Reports to LDEQ:

1st Quarter	January 1
2nd Quarter	April 1
3rd Quarter	July 1
4th Quarter	October 1

See Section A9 for additional report information.

Data Review, Validation and Verification Requirements

The Blue Thumb coordinator has a scientific/technical background including knowledge and experience in water quality and analytical testing. The coordinator expects to use this knowledge and background along with information from the QC Workshops to determine if test results are within acceptable measurement range, and valid.

Section D2

Validation and Verification Methods

The Blue Thumb Project Coordinator will review water Quality Data Sheets upon receipt. Volunteers will be contacted to resolve any problems or errors found on their data sheets. Outliers and inconsistencies will be flagged for further review, and usefulness in the education program.

Section D3

Reconciliation with Data Quality Objectives

All data that are determined acceptable will be suitable for educational purposes.

References

Cheadle, Cheryl. 2000. Personal Correspondence. Oklahoma Blue Thumb Project. Tulsa, Oklahoma.

Hach Company. 2000. Prepared Testing Instructions. Loveland, Colorado

Louisiana Department of Environmental Quality (LDEQ). 1999. *Nonpoint Source Management Program Report.* Louisiana Water Quality Management Plan. Office of Water Resources. Baton Rogue, Louisiana.

Louisiana Department of Environmental Quality (LDEQ). 2000. *Water Quality Inventory, 305 (b) Report.* Louisiana Water Quality Management Plan. Office of Water Resources. Baton Rogue, Louisiana.

Louisiana Department of Environmental Quality (LDEQ). 1999. *Nonpoint Source Annual Report.* Office of Water Resources. Baton Rogue, Louisiana.

Louisiana Department of Environmental Quality (LDEQ). 1996. *Louisiana Water Quality Management Plan.* Office of Water Resources. Baton Rogue, Louisiana.

Mitchell, Mark K. and William B. Stapp. 1995. *Field Manual for Water Quality Monitoring.* Dexter, Michigan: Thomson-Shore Printers.

Appendix A

Blue Thumb Data Sheet

Blue Thumb Data Sheet

Location: _____ Parish: _____
Date: _____ Time: _____
Monitors: _____

Weather: Circle one item from each column. Data is important for future verification. Do not monitor if lightening is occurring.

SKY	WIND SPEED (Beaufort Scale)	WIND DIRECTION (Circle the Direction)
0 Cloudless	0 Calm; smoke rises vertically	
1 Partly Cloudy	1 Wind shown by smoke drift	
2 Overcast	2 Wind felt on face	
3 Fog/Haze	3 Leaves/small twigs in motion	
4 Drizzle	4 Small branches; dust raised	
5 Intermittent Rain	5 Small trees sway	
6 Rain		

Site Condition: Circle *all* that you see.

WATER CONDITION	SHORE
1. Clean	1. Clean
2. Film of Pollen	2. Natural Debris
3. Floating Debris	3. Good Vegetative Cover
4. Oily Film	4. Grass Mowed to Edge
5. Algae Bloom	5. Erosion
6. Trash	6. Animal Activity
	7. Trash
	8. Leaves/Grass Clippings

RecentDisturbances:_____

_____

Temperature: Always measure air temperature first. Measure both for 2 minutes.
Air: _____ C Water: _____ C (Put bulb 6" below surface. Read while still in water.)

Water Level: Number of inches above or below fixed line _____ (Is it + or - ?)

Water Clarity: Use Secchi Disk. _____ inches

1. Keep the sun at your back when doing the Secchi dip.
2. Drop into water until disk can't be seen.
3. Bring back up a bit until black and white quadrants are barely visible.
4. Note water depth on rope or chain.
5. Repeat until two dips in a row result in the same water depth.
6. Measure the distance from the disk to the noted water line for best accuracy. The chain is marked in 6" increments.

If Secchi disk is visible while resting on the bottom, be sure to use the "greater than" (>) symbol when recording your depth.

Dissolved Oxygen Test

Range	Comments	Reading	Calculations	mg/L D.O.
High-use this most of the time.	Count drops of sodium thiosulfate to bring color change from yellow (or blue) to colorless. Don't go beyond.	No Blank 1. _____ 2. _____	None. Each drop= 1 mg/L of dissolved oxygen	1. _____mg/L 2. _____mg/L
Low-switch to this if Reading is less than 3	Pour off contents to 30 ml. Each drop=0.2 mg/L D.O.	No Blank 1. _____ 2. _____	Multiply # drops by 0.2	1. _____mg/L 2. _____mg/L

Note: This test is the reason you must try to monitor in the a.m. at the same time each month. Do this test before carrying the remainder of the samples indoors to complete other tests.

Interpreting Results: Values less than 3 mg/L D.O. stress the fish.

To calculate % D.O. saturation, use a straight edge to connect the D.O. value at the bottom with the temperature on top. Then read and record % saturation off the diagonal line.

_____% Oxygen Saturation

pH Test

No Blank	1._____pH	2. _____pH

Interpreting Results: Any pH between 5.5-9.5 is optimum for most aquatic organisms in our bayous.

Nitrate Nitrogen Test:

Range	Comments	Reading	Calculation	mg/L N
Low: 0-1 mg/l N read directly on wheel	Use 5.0 ml of sample: the line just below the frosted part of the test tube	Blank_____ 1. _____ 2. _____	None.	Blank_____mg/L 1. _____mg/L 2. _____mg/L
High: 1-10 mg/L	Use the dropper to get a 0.5 ml sample.	Blank_____ 1. _____ 2. _____	Multiply by 10.	Blank_____mg/L 1. _____mg/L 2. _____mg/L

Note: For high range test, bring sample up to 5 ml level by adding deionized rinse water.

Interpreting Results: <0.3 is good. 0.3-1.0 is cause for concern. >1.0 cause major ecological problems...Call us.

Ammonia (NH_3-N) Test

	0.0-0.2 mg/L	0.2-0.4 mg/L	0.4-0.6 mg/L	0.6-0.8 mg/L	0.8-1.0 mg/L
Blank					
1.					
2.					

Note: Match the color of the sample to the color on the cube. To record your result, place a check mark in the box under the correct reading.

Interpreting Results: An ammonia level of 0.4 or less is acceptable. A level of 1.0 or greater is toxic to many fish.

Orthophosphate (PO_4) Test

Range	Comments	Reading	Calculation	mg/L P
Low:0-1 mg/L PO_4 0-.33 mg/L P	Use mirror and no caps	Blank_____ 1._____ 2._____	Divide by 150	Blank_____mg/L 1._____mg/L 2._____mg/L
Mid: 0-5 mg/L PO_4 0-1.67 mg/L P	Read directly through sample. Do not use the mirror.	Blank_____ 1._____ 2._____	Divide by 30	Blank_____mg/L 1._____mg/L 2._____mg/L

Notes: Use one packet per test. Read after 8 minutes.

Interpreting Results: <0.03= pretty good for an urban site; 0.03-0.05=alright, but not great; 0.05 or greater is cause for concern. 0.10 or greater is a sign of a serious problem. Call us...

Chloride Test:

Range	Comments	Drops Used	Calculation	mg/L CL
Low: 0-100mg/L	Fill mixing bottle to 23 ml line	Blank_____ 1._____ 2._____	Multiply by 5.	Blank_____mg/L 1._____mg/L 2._____mg/L
High: 0-400 mg/L	Use measuring tube to measure water into mixing bottle.	Blank_____ 1._____ 2._____	Multiply by 20.	Blank_____mg/L 1._____mg/L 2._____mg/L

Note: The color change is very rapid. It will turn yellow to orange. Rust color is too far.

Interpreting Results: If the results are over 100...call us. This much chloride is not toxic to most aquatic life, but does indicate pollution.

!!! Rinse Procedures !!!

1. **Before blank test:**
- Rinse twice with deionized water.
2. **After blank test:**
- Rinse 3 times with deionized water.
3. **Before 1st sample test:**
- Rinse twice with sample water.
4. **After 1st sample test:**
- Rinse twice with sample water.
- Rinse twice with deionized water.
- Rinse twice with sample water.
5. **After the last test:**
- Rinse twice with sample water.
- Rinse twice with deionized water.

Place all waste generated into a plastic container. Dispose of waste by flushing it down the toilet. NEVER dump waste on the ground!!!

Rules of the Water Monitoring Game:

1. Dissolved Oxygen should be done on site.
2. Always run blanks using deionized water.
3. Use sample water in comparator tubes.
4. Fill in raw data and calculated data.
5. Rinse, rinse, rinse! Even a little bit of residue left from a previous test will alter the results!
6. Achieve repeatability.
7. Mail this data sheet to the Blue Thumb Coordinator at the following address:
   Teche/Vermilion Blue Thumb Project
   Acadiana RC&D Council
   3419 NW Evangeline Thruway, Suite B-9
   Carencro, Louisiana 70520
8. Wash all equipment in lab detergent. Rinse 3 times in hot tap water. Rinse 3 times with deionized water. Allow equipment to air dry. Put equipment away. Store in a temperature controlled environment out of reach of children.
9. For help or information call: Kelly Taylor, (337) 896-0362

Directions to the nearest hospital or medical center_____

_____

_____

_____

Appendix B

Quality Assurance Checklist

Teche/Vermilion Blue Thumb Project

Quality Assurance Checklist

This form has been designed for reviewing the water monitoring skills of volunteers participating in the Teche/Vermilion Blue Thumb Project. For information on instructions and techniques used by the monitors, please refer to the **Test Instructions** included in each test kit.

Each question is worth 14.3 points. A minimum score of 86% is required. Each item missed will be discussed in detail with the volunteer so that he or she may learn from their mistakes.

1. Volunteer followed proper rinse procedures. _____yes _____no

2. Volunteer used the correct sampling technique for the test being conducted. _____yes _____no

3. Volunteer recorded raw AND calculated data _____yes _____no

4. Volunteer properly washed equipment after use. _____yes _____no

5. Volunteer utilized safety equipment. _____yes _____no

6. Volunteer completely filled out the entire data sheet. _____yes _____no

7. Volunteer followed timing instructions _____yes _____no

Date: _____

Name: _____ Parish: _____

Monitoring Site: _____

Appendix C

Hach Test Kit Procedures

Dissolved Oxygen Test

This test will be run **twice** following the instructions below. A blank is NOT run.

1. Follow rinse procedure as outlined on the Blue Thumb Data Sheet.

2. Fill the Dissolved Oxygen bottle (round bottle with glass stopper) with the water to be tested by putting it in the water upside down "wrist deep." Turn it over slowly, allowing the air bubbles to escape gradually. Lift the bottle straight to the surface.

3. Open one Dissolved Oxygen 1 Reagent Powder Pillow and one Dissolved Oxygen 2 Reagent Powder Pillow. Add the contents of each of the pillows to the bottle. Stopper the bottle carefully to exclude air bubbles.

4. Grip the bottle and stopper firmly; shake vigorously to mix. A flocculent (floc) precipitate will be formed. If oxygen is present in the sample, the precipitate will be brownish orange in color. A small amount of powdered reagent may remain stuck to the bottom of the bottle. This will not affect the test results.

5. Allow the sample to stand until the floc has settled below the line on the bottle, leaving the upper half of the sample clear.

6. Shake the bottle again.

7. Allow the sample to stand until the floc has settled below the line on the bottle. (Note: The floc will not settle in samples with high concentrations of chloride. No interference with the test results will occur as long as the sample is allowed to stand for four to five minutes.)

8. Open one Dissolved Oxygen 3 Reagent Powder Pillow. Remove the stopper from the bottle and add the contents of the pillow.

9. Carefully restopper the bottle. To avoid trapping air bubbles in the bottle, incline the bottle slightly and insert the stopper with a quick thrust. If bubbles do become trapped, discard the sample and repeat the test.

10. Grip the bottle and stopper firmly; shake vigorously to mix. The floc will dissolve and a yellow color will develop if oxygen is present.

Dissolved Oxygen Test (continued)

11. Fill the plastic measuring tube level full of the sample prepared. Pour the sample into the square-mixing bottle.

11. Add two drops of starch indicator solution to the square-mixing bottle. The sample will turn dark blue/black.

12. Add Sodium Thiosulfate Standard Solution drop by drop to the mixing bottle, swirling to mix after each drop. Hold the dropper vertically above the bottle and count each drop as it is added. Continue to add drops until the sample changes from blue/black to colorless. Each drop used is equal to 1 mg/L of dissolved oxygen (DO).

13. Record your results on the data sheet. If your reading is less than three, pour off bottle contents to 30 ml. Continue to add drops of Sodium Thiosulfate Standard Solution. Each drop is equal to 0.2 mg/L of DO. Record your results.

14. On the data sheet, calculate the percent oxygen saturation by using a straight edge to connect the DO value on the bottom scale with the temperature on the top scale. Read and record the percent saturation on the diagonal line. (See Appendix A)

pH Test

This test will be run **twice** following the instructions below. A blank is NOT run.

1. Follow rinse procedure as outlined on the Blue Thumb Data Sheet.
2. Fill both tubes to the 5-ml mark with the water sample.
3. Add six drops of Wide Range pH Indicator Solution to one of the tubes and swirl to mix.
4. Insert the prepared sample in the inside opening of the color comparator.
5. Insert the tube with the untreated sample in the outside opening of the comparator.
6. Hold the color comparator up to a light source such as the sky, a window, a lamp, or something white and view through the two openings in the front. Rotate the color disc to obtain a color match. Read the pH from the scale window.
7. Record your data on the data sheet.

Nitrate Test

This test will be run twice following the instructions below. A blank is run.

Low Range Nitrate Test (0-1 mg/L N)

1. Follow rinse procedure as outlined on the Blue Thumb Data Sheet.
2. Fill one tube to the 5-mL mark with the water to be tested.
3. Open one NitraVer 6 Nitrate Reagent Powder Pillow. Add the contents of the pillow to the tube with the sample water in it. Stopper the tube and shake for three (3) minutes.
4. Allow the sample to stand undisturbed for 30 seconds. Unoxidized particles of cadmium metal will settle to the bottom of the viewing tube.
5. Pour the sample into a second test tube, leaving the cadmium in the last drop of water in the first tube.
6. Add the contents of one NitriVer 3 Reagent Powder Pillow to the sample. Stopper the tube and shake fo r30 seconds.
7. Allow 10 minutes for red color to develop.

	Start Time	End Time
Blank	_____	_____
1st Test	_____	_____
2nd Test	_____	_____

8. While waiting the 10 minutes, rinse the unoxidized cadmium metal from the tube used above into the "dry" waste using as little water as possible. Fill the tube to the 5 ml mark with untreated sample.
9. Insert the prepared sample in the inside opening of the color comparator.
10. Insert the tube with the untreated sample in the outside opening of the comparator.
11. Hold the color comparator up to a light source such as the sky, a window, a lamp or something white and view through the two openings in the front. Rotate the color disc to obtain a color match. Sometimes on this test, the color of the sample is yellowish. Try to match the intensity of color, not the identical color.
12. Read the mg/L nitrate nitrogen from the scale window. Record your results. There are no calculations. If the scale reads above 0.7, do the mid-range test (on the back of this sheet).

Mid Range Nitrate Test (0-5 mg/L N)

1. Follow rinse procedure as outlined on the Blue Thumb Data Sheet.

2. Use the dropper to put 1.0 mL of sample water in a test tube. Add deionized water to fill the test tube to the 5 ml mark.

3. Open one NitraVer 6 Nitrate Reagent Powder Pillow. Add the contents of the pillow to the tube with the sample water in it. Stopper the tube and shake for three (3) minutes.

4. Allow the sample to stand undisturbed for 30 seconds. Unoxidized particles of cadmium metal will settle to the bottom of the viewing tube.

5. Pour the sample into a second test tube, leaving the cadmium in the last drop of water in the first tube.

6. Add the contents of one NitriVer 3 Reagent Powder Pillow to the sample. Stopper the tube and shake for 30 seconds.

7. Allow 10 minutes for red color to develop.

	Start Time	End Time
Blank	_____	_____
1st Test	_____	_____
2nd Test	_____	_____

8. While waiting the 10 minutes, rinse the unoxidized cadmium metal from the tube used above into the "dry" waste using as little water as possible. Fill the tube to the 5 ml mark with untreated sample.

9. Insert the prepared sample in the inside opening of the color comparator.

10. Insert the tube with the untreated sample in the outside opening of the comparator.

11. Hold the color comparator up to a light source such as the sky, a window, a lamp or something white and view through the two openings in the front. Rotate the color disc to obtain a color match. Sometimes on this test, the color of the sample is yellowish. Try to match the intensity of color, not the identical color.

12. Read your results from the scale window. Record your reading on the data sheet. If the scale reads above 0.7, do the high-range test.

13. **Multiply** your reading **by 5** to get mg/L N. Record your results on the data sheet

High Range Nitrate Test (0-5 mg/L N)

1. Follow rinse procedure as outlined on the Blue Thumb Data Sheet.

2. Use the dropper to put 0.5 mL of sample water in a test tube. Add deionized water to fill the test tube to the 5 ml mark.

3. Open one NitraVer 6 Nitrate Reagent Powder Pillow. Add the contents of the pillow to the tube with the sample water in it. Stopper the tube and shake for three (3) minutes.

4. Allow the sample to stand undisturbed for 30 seconds. Unoxidized particles of cadmium metal will settle to the bottom of the viewing tube.

5. Pour the sample into a second test tube, leaving the cadmium in the last drop of water in the first tube.

6. Add the contents of one NitriVer 3 Reagent Powder Pillow to the sample. Stopper the tube and shake for 30 seconds.

7. Allow 10 minutes for red color to develop.

	Start Time	End Time
Blank	_____	_____
1st Test	_____	_____
2nd Test	_____	_____

8. While waiting the 10 minutes, rinse the unoxidized cadmium metal from the tube used above into the "dry" waste using as little water as possible. Fill the tube to the 5 ml mark with untreated sample.

9. Insert the prepared sample in the inside opening of the color comparator.

10. Insert the tube with the untreated sample in the outside opening of the comparator.

11. Hold the color comparator up to a light source such as the sky, a window, a lamp or something white and view through the two openings in the front. Rotate the color disc to obtain a color match. Sometimes on this test, the color of the sample is yellowish. Try to match the intensity of color, not the identical color.

12. Read your results from the scale window. Record your reading on the data sheet.

13. **Multiply** your reading **by 10** to get mg/L N. Record your results on the data sheet

Ammonia Test

This test will be run **twice** following the instructions below. A blank is run.

1. Follow rinse procedure as outlined on the Blue Thumb Data Sheet.

2. Fill test cube to the mark with the water sample.

3. Open and add the contents of the Ammonia Salicylate Reagent Powder Pillow. Cap and shake gently until the powder is dissolved.

4. Open and add the contents of the Ammonia Cyanurate Reagent Powder Pillow. Cap and shake gently to mix.

5. Time 15 minutes for color development.

	Start Time	End Time
Blank	_____	_____
1st Test	_____	_____
2nd Test	_____	_____

6. Match the color of the sample and the color on the cube.

7. Record your results on the data sheet.

Orthophosphate Test

This test will be run **twice** following the instructions below. A blank is run.

Orthophosphate Low Range Test (0-1 mg/L P)

1. Follow rinse procedure as outlined on the Blue Thumb Data Sheet.

2. Fill the square-mixing bottle to the 20-ml mark with the water to be tested.

3. Open one PhosVer 3 Phosphate Reagent Powder Pillow. Add the contents of the pillow to the bottle, and swirl to mix. Time 8 minutes for full color to develop.

	Start Time	End Time
Blank	_____	_____
1st Test	_____	_____
2nd Test	_____	_____

4. Insert the lengthwise viewing adapter (the mirror) into the comparator.

5. Fill one sample tube to the line approximately 1 inch below the top of the tube with the prepared water sample and place in the inside opening of the color comparator.

6. Fill the other sample tube with untreated water (or a reagent blank) to the approximately 1 inch below the top of the tube. Insert this tube in the outside opening of the color comparator.

7. Orient the comparator with the tube tops pointing to a window or light source. View through the openings in the front of the comparator. When viewing, use care not to spill samples from the tops of the tubes.

8. Rotate the disc to obtain a color match. Read the concentration of the measured parameter through the scale window. Record the reading.

9. **Divide by 150** to calculate mg/L PO_4 and record your answer. If your calculated answer is close to 1 mg/L, do the mid-range test (following this page).

Orthophosphate Mid Range Test (0-5 mg/L P)

1. Follow rinse procedure as outlined on the Blue Thumb Data Sheet.

2. Fill both of the color viewing tubes to the 5-ml mark with the water to be tested.

3. Open one PhosVer 3 Phosphate Reagent Powder Pillow. Add the contents to one of the tubes. Swirl to mix. Time for 8 minutes.

	Start Time	End Time
Blank	_____	_____
1st Test	_____	_____
2nd Test	_____	_____

4. Insert the tube of prepared sample into the inside opening and the untreated sample into the outside opening of the color comparator. Be sure you have removed the lengthwise viewing adapter (mirror).

5. Hold the comparator up to a light source like the sky, a window or a lamp and view through the two openings in front. Rotate the disc to obtain a color match.

6. Rotate the disc to obtain a color match. Read the concentration of the measured parameter through the scale window. Record the reading.

7. **Divide by 30** to calculate mg/L PO_4 and record your answer.

Chloride Test

This test will be run **twice** following the instructions below. A blank is run.

Chloride Test Low Range (0-100 mg/L Cl)

1. Follow rinse procedure as outlined on the Blue Thumb Data Sheet.
2. Fill the mixing bottle with sample water to the 23 ml mark.
3. Add the contents of one Chloride 2 Indicator Powder Pillow. Swirl to mix.
4. Add the Silver Nitrate Titrant drop by drop to the water in the mixing bottle. Hold the dropper in a vertical position and swirl the bottle to mix after each drop is added. Count each drop as it is added until the color changes from yellow to orange. **An orange-red, rust color indicates the end point has been exceeded and the test must be redone.**
5. Record your raw data on the data sheet.
6. **Multiply by 5** to calculate mg/L chloride and record you answer. If your calculated answer exceeds 100mg/L retest using the high range test.

Chloride Test High Range (0-400 mg/L Cl)

1. Fill the plastic measuring tube with sample water. Pour into the rinsed mixing bottle.
2. Add the contents of one Chloride 2 Indicator Powder Pillow. Swirl to mix.
2. Add the Silver Nitrate Titrant drop by drop to the water in the mixing bottle. Hold the dropper in a vertical position and swirl the bottle to mix after each drop is added. Count each drop as it is added until the color changes from yellow to orange. **An orange-red, rust color indicates the end point has been exceeded and the test must be redone.**
3. Record your raw data on the data sheet.
4. **Multiply by 20** to calculate mg/L chloride and record you answer.

Secchi Disk

1. Keep the sun at your back when doing the Secchi dip.
2. Drop into water until disk can't be seen.
3. Bring it back up a bit until the black and white quadrants are barely visible.
4. Note water depth on rope or chain.
5. Repeat until two dips in a row result in the same water depth.
6. Measure the distance from the disk to the noted water line for best accuracy. The chain is marked in 6" inch increments.